

Before the  
**Federal Communications Commission**  
Washington, DC 20554

In the Matter of	)	
	)	
Facilitating Opportunities for Flexible,	)	ET Docket No. 03-108
Efficient, and Reliable Spectrum Use	)	
Employing Cognitive Radio Technologies	)	
	)	
Authorization and Use of Software	)	ET Docket No. 00-47
Defined Radios	)	
	)	

NOTICE OF PROPOSED RULE MAKING AND ORDER      FCC 03-322

**Comments of Data Flow Systems, Inc.**

Data Flow Systems, Inc, a Florida Corporation, hereby submits the following comments with respect to the Notice of Proposed Rulemaking and Order (“NPRM”) issued in the above-captioned proceeding.

I. Introduction

Data Flow Systems, Inc (DFS) supports the use of cognitive radio technology and believes it can make more intensive and efficient use of spectrum. DFS recognized this capability over a year ago when it launched its development of such a radio.

This product will be ready for field-deployment in Q3 of this year.

DFS has deployed nearly 2,000 radios in many networks around the US over the past 10 years. Spectrum access for these networks is done on a secondary basis in the 218 and 433 MHz frequency bands. These networks are used by municipal governments and to manage the flow of wastewater within a city or county and on military bases. DFS has

taken great care as a secondary user to avoid the potential of interfering with primary users.

The development of the cognitive radio resulted from this concern. DFS has extensive experience designing and installing radios in the above-mentioned bands and as a result has closely monitored its use over the past 10 years. It is very clear that significantly inefficient use of spectrum is common in almost all areas. DFS believes that the use of cognitive radios like the one it is developing would allow much more intensive and efficient use of spectrum. This same technology could, of course, be applied to almost any other band.

The DFS cognitive radio, known as the Phantom™ and manufactured by the DFS affiliated division, Adapt4 LLC., is a software defined radio (SDR) that cognitively supports all of the capabilities described in Item 22 (page9) of the referenced NPRM. Namely the following:

**a. Frequency Agility**

The Phantom™ can transmit and receive at any frequency within the entire operating band with 6.25 kHz resolution. This level of agility allows it to “work-around” other users on a non-interfering bases.

**b. Dynamic Frequency Selection**

The DFS radio couples its high-degree of agility with sophisticated spectrum use sensing algorithms to automatically select unused channels. This algorithm runs on a continuous basis and unique, unused channels can be selected on a

transmission-by-transmission basis.

#### **c. Adaptive Modulation**

The Phantom™, based on the availability of unused spectrum, can dynamically adjust its data rate, modulation and even FEC coding to avoid interference at the exact instance of transmission.

#### **d. Transmit Power Control**

The DFS radio receives feedback from all receivers regarding the received signal strength. The transmitter adjusts its RF output power to a level, which just meets the minimum SNR at the receiver. This avoids transmitting more interference than necessary.

#### **e. Location Determination**

Each radio installed by DFS has its (fixed) location identified. Also known are the locations of neighboring radios within communications range. If regional constraints regarding the use of power and frequency are implemented, each radio could easily conform.

#### **f. Spectrum Sharing Mechanism**

The DFS radio has the capability to allow for spectrum sharing based on conditions such as time of day or the occurrence of an emergency condition signaled by special command signal. Interruptible Spectrum Leasing could also be supported using a “beacon” or other command signal to activate reversion.

#### **g. Interoperability between Communication Systems**

The Phantom™ could easily be configured in the near future to provide

interoperability by integrating it with smart antenna technologies and :

- (1) IP backbone networks.
- (2) Multiple transmit and receive frequencies. (Phase II)
- (3) SDR waveform technology.

#### **h. Mesh Networks**

The Phantom's new Digi-Routing™, based on DFS's current range extension technology, will have the capability of “whispering” at low power to far away nodes, providing a spectrally efficient and interference-avoidance method of relaying messages.

As you can see DFS supports all of the five (5) key capabilities mentions in the NPRM, Item 22 (page 9) as well as many of the objectives of Interrupted Spectrum Leasing, Section 2 (page 20); Interoperability, Section 2, (page 28); and Mesh Networks, Section 3 (page 30).

The Phantom™ radio also incorporates many of the features desired by the Federal Governments DARPA XG program as mentioned in Section II, paragraph 16, page 7.

DFS had taken the initiative over a year ago to move towards cognitive radio technology.

It was motivated by recognition of the inefficient utilization of spectrum for primary users

and the business-driven need for more intensive non-interfering technology. Cognitive technologies, such as the Phantom™ Radio, will help our Federal, State, and Local governments to carefully manage the grow, protection, and processing of fresh water and safe disposal of wastewaters.

Respectfully submitted,  
Paul G. Greenis  
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